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Original research

IMPACT OF MAGNESIUM AND VITAMIN B6 NUTRITIONAL SUPPLEMENT ON COMORBID COURSE OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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Key words: *oxalates, chronic obstructive pulmonary disease, chronic pyelonephritis, magnesium.*

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Abstract. Objective. *To determine the effectiveness of treatment with magnesium and pyridoxine nutritional supplement in chronic obstructive pulmonary disease comorbid patients.*
Material and methods. *The study was conducted with the involvement of 63 patients who were admitted to the pulmonology and urology departments of Chernivtsi Regional Emergency Hospital — University Clinic. A comparative and statistical analysis of the parameters of the respiratory and renal function before and after the application of magnesium and pyridoxine was done with IBM SPSS Statistics v.20.*
Results. *After treatment with combined nutritional supplement of magnesium lactate dihydrate and pyridoxine in patients with comorbid chronic obstructive pulmonary disease, chronic pyelonephritis and oxalic urolithiasis, serum level of magnesium was (1,51±0,08) mmol/l. Magnesium and pyridoxine supplement influenced glomerular filtration rate in patients in the group with comorbidity, after taking the supplement it was (90,7 ± 5,04 mL/min/1,73 m² (p <0,05), when compared with the same index in this group before the treatment, improvement of the renal function was noted.*
Conclusion. *Nutritional intervention enables to modify the course of the polymobid diseases that is included in respiratory optimization, exacerbation control, correction of renal function.*

Ключові слова: *оксалати, хронічне обструктивне запалення легень, хронічний пієлонефрит, сечокам'яна хвороба, магній.*

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ВПЛИВ ПРЕПАРАТУ МАГНІЮ ТА ВІТАМІНУ В6 НА ПЕРЕБІГ КОМОРБІДНОГО ХРОНІЧНОГО ОБСТРУКТИВНОГО ЗАХВОРЮВАННЯ ЛЕГЕНЬ

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Резюме. Мета роботи – *визначити ефективність лікування препаратом магнію та піридоксину пацієнтів із коморбідним перебігом хронічного обструктивного захворювання легень.*
Матеріал і методи. *На базі лікарні швидкої медичної допомоги м. Чернівці — "Університетська лікарня" проведено обстеження 63 пацієнтів, які перебували на стаціонарному лікуванні в пульмонологічному та урологічному відділеннях. Порівняльний аналіз даних показників респіраторної функції та функції нирок і статистична обробка проводилися у програмі IBM SPSS Statistics v.20.*
Результати. *Після лікування комбінованим препаратом магнію лактату дигідрату та піридоксину в пацієнтів із хронічним обструктивним захворюванням легень, хронічним пієлонефритом та сечокам'яною хворобою рівень магнію становив (1,51±0,08) ммоль /л. Лікування комбінованим препаратом магнію та піридоксину позитивно вплинуло на функцію нирок, показник швидкості клу-*

бочкової фільтрації після лікування склав (90,7±5,04 mL/min/1,73 m² (p <0,05), що є значно вищим, ніж до початку лікування.
Висновок. *Корекція метаболічного дисбалансу за допомогою застосування нутритивних препаратів, у даному випадку комбінації магнію та піридоксину, дозволяє змінити перебіг коморбідного хронічного обструктивного захворювання легень, оптимізувавши респіраторну функцію та функцію нирок.*

Ключевые слова: *оксалаты, хроническая остуктивная болезнь лёгких, хронический пиелонефрит, мочекаменная болезнь, магний.*

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ВЛИЯНИЕ ПРЕПАРАТА МАГНИЯ И ВИТАМИНА В6 НА ТЕЧЕНИЕ КОМОРБИДНОЙ ХРОНИЧЕСКОЙ ОБСТРУКТИВНОЙ БОЛЕЗНИ ЛЕГКИХ

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Резюме. Цель работы *— определение эффективности лечения препаратом магния и пиридоксина пациентов с коморбидным течением хронической обструктивной болезни легких.*
Материал и методы. *Исследование было проведено на базе Черновицкой больницы скорой помощи — "Университетской клиники".В исследование были вовлечены 63 пациента, которые проходили лечение в отделениях пульмонологии и урологии. Сравнительный анализ со статистической обработкой результатов состояния функции легких и функционального состояния почек до и после терапии препаратом магния и пиридоксина был проведен в программе IBM SPSS Statistics v.20.*
Результаты. *После лечения комбинированным препаратом магния лактата дигидрата и пиридоксина у пациентов с хронической обструктивной болезнью легких, хроническим пиелонефритом и мочекаменной болезнью уровень магния был (1,51±0,08) ммоль /л. Лечение комбинированным препаратом магния и пиридоксина повлияло на скорость клубочковой фильтрации у пациентов группы с коморбидностью. Уровень скорости клубочковой фильтрации после лечения (90,7 ± 5,04 mL/min/1,73 m² (p<0,05), что было значительно выше по сравнению с данными этого показателя в группе пациентов с коморбидностью до лечения.*
Вывод. *Коррекция метаболического дисбаланса при помощи использования нутритивных препаратов магния и пиридоксина позволяет изменить течение хронической обструктивной болезни легких с коморбидностью, оптимизировав респираторную функцию и функцию почек.*

Introduction. Chronic obstructive pulmonary disease (COPD) is one of the major problems in healthcare nowadays. The World Health Organization (WHO) predicts that by 2020 COPD will be fifth leading disease that causes disability [1]. About 15% of COPD patients need hospitalization with elements of intensive respiratory care for acute exacerbation, that is uncomfortable for the patient and medical resources [2,3]. Even through therapeutical approach to COPD is being improved recently, acid-base disorders and electrolyte imbalance remain issues that confound the outcome causing metabolic acidosis and systemic inflammation. Metabolic acidosis contributes to development of chronic pyelonephritis and urolithiasis (UL) making COPD treatment prognosis adversely affected by such polymorbidity[4,5,6]. The other part of COPD comorbid situation is the treatment of acute infectious exacerbations. In comorbid COPD, bacterial infection can induce inflammation both in terms of exacerbations and in the stable state. According to the clinical protocol, antibiotics have been used as standard treatment of COPD exacerbations, but their significance in this context remains uncertain [7]. According to the GOLD (Global Ini-

tiative for Chronic Obstructive Lung Disease) guidelines managing comorbidities in COPD is important. COPD is a preventable and treatable disease, but in the case of comorbidity with chronic pyelonephritis (CP) with urolithiasis it should be treated with additional nutrition supplement support in order to correct ionic imbalance [8]. Very often UL is caused by oxalic acid stones. This disturbance of metabolism of calcium and oxalic acid is manifested in dysmetabolic nephropathy (DN) [9] and respiratory oxalosis, aggressive COPD phenotype, usually with muscle weakness. Nutritional support in COPD comorbid patients, appears to be more a modifiable factor that can prevent development of acute complications. To normalize the exchange of oxalic acid and reduce calculi deposition it is advisable to add nutritional supplement of calcium ionic antagonist — magnesium and pyridoxine (B6) to the complex therapy of COPD and CP [10].

Objective. To determine the effectiveness of treatment with addition of magnesium and pyridoxine (vitamin B6) nutritional supplement in chronic obstructive pulmonary disease and comorbid chronic pyelonephritis with urolithiasis patients.

Material and methods. The study was conducted with the involvement of 63 patients who were admitted to the pulmonology and urology departments of Chernivtsi Regional Emergency Hospital — University Clinic. The diagnoses of the chronic obstructive pulmonary disease and chronic pyelonephritis with urolithiasis were done according to the national and international diagnostic protocols. The criteria of airflow obstruction and risk factors were spirometry parameters: forced expiratory volume in 1 second (FEV1) between 30 and 50% predicted and FEV1/FVC ratio (where FEV1 is forced expiratory volume in 1 second and FVC is forced vital capacity) < 70% that is C and D grades in GOLD2017 guidelines. The severity of symptoms was estimated by the mMRC scale (modified Medical Research Council Dyspnea scale). Exacerbation history (>2 times per year) of each patient was taken into account during pulmonary function evaluation procedure. In case when several diagnostic risk factors were from different categories, risk factor with the highest score was used. Spirometry was done with Spirometer"Microlab-3300" ("Sensor — Medics", Netherlands).

Patients were divided into the following study groups: group I — 20 patients with CP and UL who received treatment in accordance with the clinical protocol for the management of patients with urolithiasis and in accordance with the order of the Ministry of Health of Ukraine dated 12.12.2004 No. 593; group II — 20 patients with isolated COPD who received treatment according to the order of the Ministry of Health of Ukraine from 555 dated 27.06.2013; group III-23 patients with comorbid COPD, CP and UL, who, in addition to standardized treatment in accordance with the above stated protocols, received nutritional supplement of 470 mg magnesium lactate dihydrate, that is a dose equivalent to 48 mg of magnesium and pyridoxine hydrochloride in a dose of 5 mg orally 3 times a day for 30 days. The control group consisted of 20 practically healthy persons (PHP). Patients of study groups and control group participants were of corresponding age and sex that gives the possibility to compare the data of these groups.

Exclusion criteria from the study were the patients who had the following health conditions: diabetes, coronary artery disease, acute coronary syndrome, myocardial infarction, valvular heart disease, heart failure (II-III stage; III-IV FC with left ventricular ejection fraction below 45%), acute cerebrovascular accident, rheumatic diseases (rheumatic fever, diffuse connective tissue diseases, etc.), oncology and infection; viral hepatitis B and C, cirrhosis of various etiologies, mental disorders, pregnancy or lactation, acute inflammation of any localization, other decompensated diseases which may influence the results of the study. Routine clinical examinations of patients of all groups were performed: daily urine analysis with determination of the presence of oxalate salts, the level of creatinine (μmol/L), urea (mmol/L), glomerular filtration rate (ml/min), serum magnesium level (mmol /l), serum level of free calcium ions (mmol/l), spirometry with pre and post bronchodilatator (salbutamol) were done. A comparative analysis of the parameters of the respiratory and renal function before and after the application of magnesium and pyridoxine was conducted. The statistical software IBM SPSS Statistics v.20.

Results and discussion. Analysis of the data showed that patients of the III-rd group, the level of magnesium before treatment was (0,65 ± 0,11) mmol / l, which is in 1.4 times lower than in patients of the control group — (2,1 ± 0,08) mmol / l. In patients of the I-st and the II-nd groups, the level of magnesium correlated with the values of the control group. The spirometry parameters in patients of the III-rd group prior to the treatment with magnesium and pyridoxine supplement were as the following: FEV1 (62 ± 1,5)%, FEV1/FVC ratio (68,3 ± 2,1),% ($p < 0,05$), and in patients of the group II, that received standard COPD treatment, FEV1 was (64,4 ± 1,5)%, FEV1/FVC ratio (70,1 ± 0,5)% ($p < 0,05$). In both groups respiratory function was reduced, so it was correspondent to diagnostic criteria of COPD stages 2 and 3with a high risk, group C when compared with the data of the PHP group, where FEV1 was (126,51 ±

8,2)%, and FEV1/FVC ratio (102,5 ± 7,1)%.

After 30 days of treatment with the combination of magnesium and pyridoxine in addition to the main treatment, the FEV1 index in patients of the group III was (67,7 ±1,4)% (p <0,05), while in patients of the II-nd group that received standard treatment according to the protocol for COPD management, the FEV1 was (64,7 ± 1,4)% (p <0,05). After addition of combined nutritional supplement of magnesium lactate dihydrate and pyridoxine in patients of the III-rd group, serum level of magnesium was (1,51±0,08) mmol/l, and in patients of the I-st and II-nd study groups who did not receive magnesium and pyridoxine nutritional supplement, remained the same as it was at the baseline.

During glomerular filtration rate evaluation (GFR), mL/min/1.73 m² in patients of a group with comorbid pathology, this parameter before treatment was (79,2 ± 4,9) mL/min/1,73 m² (p<0,05), while in the control group it was (101,2±5,6) mL/min/1,73 m². In the I-st group GFR rate was (85,3 ± 4,1) mL/min/1,73 m² (p <0,05) indicating a significant reduction in renal function due to the presence of oxalate genesis urolithiasis. After treatment with magnesium and pyridoxine, GFR in patients in the group with comorbidity was (90,7 ± 5,04 mL/min/1,73 m² (p <0,05), when compared with the same index in this group before the treatment, means the presence of improvement of the renal functional state. In patients group I, who received standardized treatment for UL and CP, the GFR rate remained almost unchanged (86,2 ± 3,1) mL/min/1,73 m² (p<0,05).

Conclusions. Addition of magnesium and pyridoxine, alongside with the standard treatment regimens of COPD and CP, improves the general metabolic state of COPD comorbid patients, preventing the progression of dysmetabolic nephropathy and renal complications.

Prospect for further research. COPD in comorbidity with CP and UL is a special pathologic condition and the question is how to improve nutritional factors to improve prognosis. It needs to be tracked with more body function parameters, such as state of red blood system and iron metabolism.

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